**TECHNOLOGY BRIEF**

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New stress-resilient and highly productive groundnut for semi-arid ecologies

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*The Tanzanut groundnut variety provides valuable food and nutrition security for farming families in semi-arid zones. It has good tolerance to disease, resistance to drought, matures early, and yields more than twice as much grain as local checks.*

Key messages

High productivity: Yields up to 2400 kg of grain per hectare, representing more than 2x the yield of local checks

Drought tolerance: Secures harvests even in semi-arid agro-ecologies, where cereals may fail in dry years

Food and nutrition security: Reliable supply of calories, protein, essential fatty acids, and micronutrients

Source of income: Good demand for groundnut from urban consumers

# Description of the technology

The new groundnut (*Arachis hypogaea* L.) variety Tanzanut 2016 (ICGV-SM 01514) was validated and approved for release in Tanzania in 2016. Groundnut of Spanish origin, Tanzanut 2016 is a short-duration variety, which takes about 90 days to mature. Most local varieties are medium to long duration, with maturity periods ranging from 120–150 days. Tanzanut 2016 is tolerant of groundnut rosette disease (the most destructive disease in groundnut in tropical Africa) and thrives even under low rainfall and limited soil fertility. It can produce up to 2400 kg grain per hectare, representing a 64% yield advantage over the local commercial varieties Mangaka 09 and Naliendele 09.

The variety is also ideal for intercropping with pigeonpea, sorghum, or maize (systems used by smallholder farmers). Therefore, it fits nicely in the cropping systems of the central zone and other similar agro-ecological zones of Tanzania and across East and Southern Africa. The grain is rich in minerals (supplying 69 mg calcium and 2.1 mg iron per 100 g), protein (12–36%), and oil (36–54%) by volume. Groundnut is a legume producing biomass that can improve soil organic content and ‘fixing’ an average of 72.5 kg nitrogen per hectare. It is therefore suitable for incorporation in low-resource production systems.

# Conditions that favor uptake

**Agro-ecological conditions:** Groundnut is an important crop, supporting livelihoods throughout the tropics from humid to semi-arid agro-ecological zones. It grows well within latitudes 40° North and South of the Equator and requires a mean temperature of 26°C. Groundnut thrives under a range of ecological conditions, including altitudes from sea level to over 1500 m and annual rainfall from 300 to 1000 mm. It performs best in well-drained sandy loam soils or soils with a sandy texture that is mildly acidic (pH 6–6.3). These conditions allow easy penetration of the fruiting peg into the soil, a precondition for good development of the grain-bearing pods. In general, a soil temperature of around 30°C is required for good pod-setting and maturation.

**Access to inputs and markets:** Groundnut is grown for food and as a source of income, so access to markets is an essential factor in the adoption of improved varieties. Uptake of Tanzanut 2016 will also depend on farmers having access to adequate seed, and this will require investment in the formal and informal seed sectors. Groundnut is a self-pollinated crop and farmers often recycle their seed for several generations, which does not incentivize private-sector investment. Groundnut has a slow multiplication rate and this also can present a disincentive to investment. Given the increasing global demand for groundnut, the establishment and growth of farmer cooperative groups for grain marketing, coupled with effective and robust links with aggregators and other value chain actors, will increase market access, enhance demand, and encourage adoption of the new variety. Further development of national breeding programs and seed certification institutions is also required to ensure farmers can access quality seed of Tanzanut 2016.

# Alignment with household resource endowments

Most of the groundnut produced in East and Southern Africa is grown by small-scale farmers with limited irrigation and other inputs. Tanzanut 2016 is well adapted to such resource-constrained production environments and can support farmers’ livelihoods by meeting their nutritional and income needs. Groundnut haulms are usually left in the field and ploughed under for the next crop, thereby improving soil health by adding nitrogen, soil carbon, and other nutrients, which successive crops can take up. This added fertility could boost the staple cereals' yield (maize, sorghum, and pearl millet) that usually follow a groundnut crop in rotation. Farmers, therefore, do not need to invest in large quantities of expensive inorganic fertilizer. The haulms can also be fed to livestock, providing a useful fodder source, especially during periods of drought, and enabling farmers to sustain their livestock assets.

# Necessary ingredients for implementation

**Planting and soil amendments:** Tanzanut 2016 should be planted at a depth of 5 cm, at a plant spacing of 60 cm between rows and 10 cm within rows, giving a plant population of 166,000 plants per hectare. A farmer requires 80 kg of seed to sow 1 hectare of farmland. The crop can benefit from residual soil fertility, especially in crop rotations where phosphorus fertilizer was applied to the previous crop. Phosphorus is necessary for nitrogen fixation. Calcium may be applied for good pod development and seed filling. Calcium is generally applied as commercial gypsum at a rate of 200 kg per hectare.

**Crop management:** Establishing the crop at the right plant population and planting at the start of the rains reduces groundnut rosette virus disease incidence. This is because the disease vector (groundnut aphid) can move more easily within a crop and infect more plants at a low plant population. Crops planted later are more likely to be exposed to aphids breeding within other plants. Weeding is also vital to protect harvests. A poorly weeded crop may lose up to 30% of its grain yield and, when coupled with poor agronomy, losses of up to 80% may be experienced. The crop should therefore be weeded early, at three to six weeks after sowing. Earthing up the plants supports flower peg penetration into the ground, and this should be done before the onset of flowering.

**Aflatoxin mitigation:** Aflatoxin is a mycotoxin produced by the fungi *Aspergillus flavus* and *A. parasiticus*. Its presence in food is detrimental to health in both humans and mono-gastric livestock. While *Aspergillus* infects several crop species, infection is most severe in crops like groundnut that are in direct contact with the soil. Farmers will need to be trained on how to minimize aflatoxin infection, both in the field and during post-harvest operations, to prevent losses; this requires an efficient extension system and supervision throughout the value chain. The absence of premium prices for high-quality grain, i.e., not contaminated with aflatoxins, is also a disincentive for investment in groundnut, especially where additional inputs and actions are required. These issues collectively may reduce the longer-term impacts of this new variety.

# Adaptation possibilities

**Crop integration.** Tanzanut 2016 is suitable for growing as an intercrop, but since groundnut is sensitive to shading, it should preferably be grown with a crop that does not cast too much shade or compete for resources like soil moisture and nutrients. In some farming systems, farmers intercrop groundnut with pigeonpea (known as the ‘doubled-up legume’ system). This system works best when groundnut is intercropped with pigeonpea varieties with different crop phenology, i.e., growing slowly, allowing the fast-maturing groundnut to receive sufficient sunlight in the lower plant canopy. When grown as an intercrop with pigeonpea, groundnut can be planted as alternate rows, or as one row of pigeonpea followed by two rows of groundnut; or within rows, with groundnut planted at full population and pigeonpea at the half population (180 cm apart) in the same row.

**Agro-ecology.** Tanzanut 2016 has been evaluated in various ecologies in Tanzania and released commercially in Malawi, Mozambique, Uganda, and Zambia. It has shown good tolerance to disease and proven to be highly productive under annual rainfall conditions ranging from 300 to 1000 mm, at altitudes of up to 1500 m. It also adds nitrogen to the soil, an essential nutrient that is lacking in many farming systems. Its superior local adaptability compared with other varieties will expand production options, allowing farmers in marginal agro-ecologies to diversify their livelihoods by growing groundnut.

# Potential benefits to users

**Food security:** Tanzanut 2016 supports food security by securing a harvest with a relatively larger grain yield than local groundnut varieties. It is also more resilient than cereals in semi-arid ecologies, producing a better harvest in low rainfall years. Groundnut is a profitable cash crop, generating funds needed to buy food; this is especially important in central Tanzania's semi-arid ecologies, where 60% of households experience food deficits for between one and nine months annually.

**Nutrition:** By significantly increasing grain yields by up to 64% over local checks, Tanzanut 2016 provides nutritious food for the farm family, supplying valuable protein, calories, essential fatty acids, and micronutrients that are important for health, particularly for children.

**Increased incomes:** Tanzania is a member of four regional economic communities and has access to seaports, supporting the export trade. The gross margin for Tanzanut 2016 can be as high as USD 275; thus, it can support a profitable farm business.

**Soil fertility:** Tanzanut 2016 improves soil fertility by fixing nitrogen, recycling nutrients, and adding soil carbon when the haulms are ploughed under for the next crop. It thus provides a sustainable and cheap mechanism to replenish soils, especially for resource-constrained farmers, and represents a useful alternative in crop rotations and intercropping systems.

# Things to worry about

**Aflatoxin contamination:** Appropriate mitigation measures should be followed to minimize infection during harvesting, storage, and other handling processes.

**Seed availability**: The supply chain for groundnut seed is not well established, making seed availability potentially unreliable and expensive.

**Market risks.** Trade in groundnut grain in East and Southern Africa is mostly informal and exposes farmers to unscrupulous aggregators who offer low prices, taking advantage of long distances from formal markets, and weak pricing and marketing policies.

# Where was the technology validated?

On-farm adaptability testing was conducted in Kongwa District (Dodoma region) and Kiteto District (Manyara region) in central Tanzania, using a farmer participatory evaluation approach. Adaptation studies were also conducted on-station at the Tanzania Agricultural Research Institute at its Hombolo and Makutupora stations. Kongwa district lies at 1120 m above sea level, with an average annual precipitation of 556 mm. Kongwa has typical semi-arid conditions, with a temperature average of 28°C. Kiteto district lies at 1087 m above sea level. It has varying weather conditions, ranging from sub-humid to semi-arid, with annual precipitation of around 682 mm and an average ambient temperature of 19.5°C.

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# Images

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| A group of people walking down a dirt road  Description automatically generated |  |

Artwork: groundnut crop as an intercrop with pigeonpea, or showing harvest with hand holding a big bunch of groundnuts?